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RECENT HUMAN HEALTH PROBLEMS IN CALIFORNIA ASSOCIATED WITH EXPOSURE TO THE PESTICIDE DIAZINON

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Summary

Diazinon is a very widely used and quite effective pest control product in California. In 1975 and 1976, there were 56 occupational exposures attributed at least in part to Diazinon that were reported by physicians to the California Department of Food and Agriculture. Larger numbers of non-occupational exposures came to the attention of poison information centers during this time period. A review of these exposures indicated that the illnesses were primarily the result of carelessness on the part of the users. Some of the incidents involved serious systemic illness. The largest number of occupational illnesses were associated with products that contained a high concentration of active ingredient and particularly those with Xylene as the solvent. Xylene greatly increases user hazards, and its use should be discouraged when alternate less toxic solvents can be used. The largest numbers of non-occupational illnesses resulted from exposures to home-and-garden type products containing more than 15% of active ingredient. It may be desirable to limit home and garden type non-restricted products to less than this level of active ingredient. All of the Diazinon labels reviewed were deficient in warning the user of the hazards and specifically how to avoid potential exposure. They also failed to inform the physician of the type of product and the specific antidote. Labels should be improved.

ACF 59-436

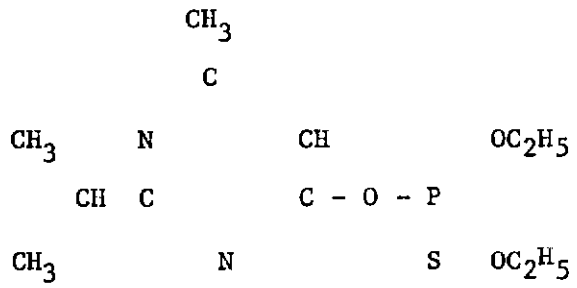
General Information

Chemical name: O,O-Diethyl O- (2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothiate.

Common name: diazinon (ISO,BSI) (except U.S. where it is a registered trademark of Ciba-Geigy Corp., Agric. Div.).

Trade names: Diazinon, Basudi+, Diazajet, Diazide, Diazatol, Diazol, Dazzel, Gardentox, Neocidol, Nucidol, Spectracide, Sarolex.

Chemical Structure:



Active ingredient of Diazinon.

Formulations: Wettable powders, emulsifiable and oil solutions, dust and granules.

Action: Insecticide, nematocide with contact and systemic poison activity.

Toxicity: Acute oral LD_{50} (rat), (tech.) 66 mg/kg
Acute Dermal LD_{50} (rat), (tech.) 379 mg/kg

Use: Diazinon is applied for the control of soil insects, such as cutworms, wireworms, and maggots. It is also effective against many pests of fruits, vegetables, tobacco, forage, field crops, range, pasture, grasslands, and ornamentals. It is used extensively in controlling cockroaches and many other household insects; grubs and nematodes in turf; seed treatment and fly control.

California Pesticide Use Report: Jan.-Dec. 1975

Chemical	Commodity	Apps.	Pounds	Acres
Diazinon				
	Agencies, Other		5,338.96	
	Alfalfa	2,008	89,453.44	179,477.00
	Almonds	600	51,996.93	30,276.25
	Apple	82	1,625.96	871.15
-T-	Apple	1	1.50	5.00
	Apricot	68	2,924.42	1,410.50
-U-	Apricot	1	2.00	3.00
	Beans	28	1,473.49	1,181.00
	Beets	6	31.00	62.00
	Berries, Other	3	98.50	103.00
	Broccoli	59	1,326.41	1,432.50
	Brussels Sprouts	148	1,768.85	3,495.83
	Cabbage	84	579.91	1,145.37
	Carrot	65	1,441.78	2,877.11
	Cauliflower	134	999.76	2,269.70
	Celery	766	5,001.21	9,983.18
	Cherries	43	1,376.75	968.00
	City Agency		1,462.85	
	Clover	6	205.00	436.00
	Collard	2	3.75	7.50
	Conifers	5	833.98	242.00
-T-	Conifers	2	5.00	706.00
	Corn	49	1,368.75	2,905.00
-U-	Corn	1	4.84	70.00
	Cotton	4	351.75	856.00
	County Agricultural Commissioners		2,365.22	
	County Road		4.13	
	Cucumber	42	594.49	1,127.50
	Deciduous Ornamental Trees	5	85.36	34.12
-T-	Deciduous Ornamental Trees	1	1.00	2.00
-U-	Deciduous Ornamental Trees	1	399.98	16,000.00
	Evergreen Trees	1	.04	.05
	Evergreen Trees, Other	2	8.75	17.00
	Federal Agency		1,586.08	
	Figs	5	175.00	117.00
-T-	Figs	1	.25	316.00
	Flood Control		15.00	
	Flowers	128	447.90	323.60
-C-	Flowers	1	.11	432.00
-U-	Flowers	1	2.80	3,000.00
	Forage, Hay and Silage	6	231.20	370.00
	Grapes	34	1,646.27	1,703.25
	Grapefruit	1	16.00	8.00
	Lettuce (Head)	1,870	25,429.55	42,789.22
	Lettuce (Leaf)	27	128.99	256.15
	Livestock Buildings	5	27.50	106.50
	Melons	65	1,919.48	3,861.00
	Nectarines	94	2,724.52	1,296.90

California Pesticide Use Report: Jan.-Dec. 1975

Chemical	Commodity	Apps.	Pounds	Acres
	Non-agricultural areas	8	149.50	85.00
	Nuts, Other	6	124.00	62.00
	Olives	1	5.00	2.00
	Onions	100	1,875.68	3,306.57
	Orange	13	678.25	1,021.50
	Ornamentals	93	493.69	741.00
-C-	Ornamentals	1	.11	432.00
-T-	Ornamentals	1	.50	15.00
	Peach	347	13,258.11	6,604.70
-T-	Peach	1	6.00	10.00
	Pear	27	1,807.60	984.00
	Peas	8	64.80	149.00
	Peppers (Bell)	5	46.25	117.00
	Plum	230	5,058.32	2,490.15
-T-	Plum	1	3.00	50.00
	Potato	1	20.00	40.00
	Prune	196	11,266.71	6,301.60
	Pumpkins	1	2.50	2.00
	Recreational Areas		364.33	
	Residential Pest Control	2	18,354.74	15.00
	Roses	4	56.10	47.00
	School Districts		362.42	
	Shrubs	1	.10	2.00
	Sorghum	129	3,289.53	6,675.00
	Spinach	91	498.30	990.16
	Squash	66	1,295.36	2,459.00
	State Highways		820.04	
	Strawberries	189	1,740.60	1,686.12
	Structural Control		24,757.93	
	Sudangrass	1	35.00	70.00
	Sugarbeet	47	2,049.50	3,680.00
	Tomato	277	7,070.02	12,964.50
	Turf	5	165.77	349.00
	Turnip	56	710.12	931.75
	University of California		384.34	
	Vector Control		334.62	
	Walnut	91	4,000.93	2,443.19
-T-	Walnut	1	2.00	14.00
	Watermelons	3	165.00	220.00
	Water Resources		404.07	
	TOTAL	8,447	309,412.77	346,740.22

California Pesticide Use Report: Jan.-Dec. 1976

Chemical	Commodity	Apps.	Pounds	Acres
Diazinon				
	Agencies, Other		7,936.81	
	Alfalfa	3,709	159,258.81	310,666.90
	Almonds	494	67,227.38	32,735.66
	Apple	51	1,412.83	690.50
	Apricot	77	4,208.62	2,382.36
-U-	Apricot	1	2.00	3.00
	Beans	33	1,323.63	848.10
	Beets	8	446.28	602.00
	Berries, Other	7	109.65	110.30
	Broccoli	79	1,892.28	1,310.68
	Brussels Sprouts	171	1,876.58	3,642.50
	Cabbage	141	766.38	1,286.40
	Carrot	46	1,633.55	1,825.00
	Cauliflower	144	1,144.87	1,988.68
	Celery	823	10,667.92	11,320.91
	Cherries	28	956.18	574.00
	Citrus, Other	2	70.00	48.00
	City Agency		1,167.14	
	Clover	9	307.50	626.00
	Collard	5	21.00	34.00
-T-	Conifers	2	1.50	2,381.00
	Corn	106	5,365.63	10,940.00
-P-	Corn	3	3.52	6,225.00
-U-	Corn	1	.01	125.00
	Cotton	20	687.46	1,317.00
	County Agricultural Commissioners		121.09	
	County Road		15.44	
	Cucumber	23	323.01	479.00
	Deciduous Ornamental Trees	13	138.87	99.00
-T-	Deciduous Ornamental Trees	1	4.50	14.00
	Federal Agency		1,495.34	
	Figs	12	1,909.00	1,909.00
	Flood Control		.16	
	Flowers	155	785.76	756.80
	Forage, Hay and Silage	2	138.00	138.00
	Grapes	20	440.07	550.00
	Grapefruit	1	32.50	65.00
	Hops	1	20.00	25.00
	Lemon	6	248.00	179.50
	Lettuce (Head)	1,582	24,633.11	34,425.83
	Lettuce (Leaf)	63	1,500.94	2,082.44
	Melons	177	7,059.74	11,990.85
	Nectarines	111	3,793.69	2,089.60
	Non-agricultural Areas	2	.78	.57
	Onions	96	1,701.13	2,708.70
	Orange	5	30.99	9.83
	Ornamentals	84	486.56	415.20
-T-	Ornamentals	1	.50	20.00
-U-	Ornamentals	1	2.00	600.00
	Pasture/Rangeland	4	162.25	132.00

California Pesticide Use Report: Jan.-Dec. 1976

Chemical	Commodity	Apps.	Pounds	Acres
	Peach	393	14,144.93	6,984.45
	Pear	17	509.35	242.50
	Peas	13	58.75	109.50
	Pecan	19	249.60	203.00
	Peppers (Bell)	7	24.89	88.51
	Pistachio	1	84.00	140.00
	Plum	325	8,002.67	3,659.50
	Potato	1	164.99	55.00
	Prune	185	15,409.72	8,523.00
	Radish	2	25.50	51.00
	Recreational Areas		545.30	
	Residential Pest Control		25,179.44	
	Roses	2	23.50	12.50
	School Districts		1,008.07	
	Sorghum	104	2,709.61	5,550.30
	Spinach	66	319.19	638.35
	Squash	49	890.33	1,727.50
	State Highways		752.33	
	Strawberries	252	2,006.38	2,131.40
	Structural Control		27,710.29	
	Sudangrass	6	468.98	468.00
	Sugarbeet	32	1,051.98	1,613.00
	Sweet Potato	1	160.00	40.00
	Tomato	294	2,723.02	9,661.96
	Turf	15	302.05	372.09
	Turnip	39	614.00	796.00
	University of California		157.75	
	Vetch	1	37.00	74.00
	Vector Control		434.44	
	Walnut	98	3,408.29	1,949.08
-T-	Walnut	2	32.00	15.00
	Watermelons	4	144.44	220.00
	Water Resources		79.65	
	Total	10,236	425,952.40	486,315.95

Acreage - When the commodity listed is prefixed by C, P, T, U, the amount listed in the respective acreage column is not acreage but one of the following, and is not included in total acreage.

C - Cubic Feet
P - Pounds
T - Trees
U - Misc. Units

Occupational Exposure Incidents That Occurred During 1975

In 1975, there were 21 occupational exposure incidents involving Diazinon that were reported to the California Department of Food and Agriculture. Of these, 11 were suspected systemic illnesses, seven were skin exposure incidents, two were eye exposure incidents, and one involved both skin and eye exposure.

Suspected Systemic Illnesses

A city employee was spraying Diazinon 50W on a tree. He was wearing a face mask and respirator during the operation and removed it when finished. The doctors' report listed the injury as chemical exposure, and the estimated period of disability was eight days. The investigator reported that it is not possible to determine the exact chemical or chemicals responsible for this incident, since it is believed the mask was not cleaned by the previous user. Steps have been taken to insure proper care of protective equipment for the future.

An employee inhaled Diazinon 4F that had been used in spraying the office in which she worked. She developed dizziness and nausea. She was unable to work for three weeks. The employer recommended that all future spraying be done during nonworking hours. The company employing the two women has recommended that no pesticides be applied in the future when employees are working within the area.

Two office workers were exposed to Diazinon 4S when a pest control employee sprayed the office, in which they were working, for paper mites. The two women complained of dizziness, stomach upset, lung congestion, watering and swelling of the eyes, and headache.

Two employees were working at their desks when an exterminator came in and sprayed the room with Diazinon. The employees complained of weakness and some dizziness. The doctors' first reports listed these both as insecticide inhalation cases and estimated the period of disability to be one day for one woman and three days for the other.

A gardner complained of pain in the eye, nausea and blurred vision after being sprayed with Diazinon. The doctors' diagnosis was chemical conjunctivitis and minimal organophosphate poisoning.

An accountant complained of headaches, nausea, coughing, hot sweats, chills, diarrhea and bloating after smelling the strong fumes of Diazinon, pyrethrins and piperonyl butoxide that had been used to spray the office in which she worked. The spraying was done midweek after work. No period of disability resulted. The employer stated that all spraying in the future would be done on weekends.

An accountant was working in a poorly ventilated office when a pest control employee entered and began spraying Diazinon 4E. The accountant felt faint and numb and was removed from the room. The investigator indicated that poor judgment had been used on the part of the pest control employee. The estimated period of disability was two weeks.

An employee complained of chest pains after Diazinon and pyrethrins had been repeatedly sprayed in the work area to kill roaches. The room was small and had poor ventilation. The investigator remarked that since no one else reacted to the spraying, the employee might have been extra sensitive to the materials used. The doctors' first report stated that the

patient had mostly recovered by the time of the examination, and there was no estimated period of disability.

A gardener was spraying plants with a small hand-pump sprayer and complained of fatigue, nausea, and a rash all over the body with some tingling sensations in the arms. The chemical being sprayed was Diazinon AG500. The doctor called it a toxic reaction to an insecticide. One day of regular work was listed as the period of disability. Carelessness in handling the pesticide by the gardener was suspected as the cause. He is no longer permitted to use pesticides.

Skin Exposures

A nursery worker was picking flowers sprayed with Zineb 5 and Diazinon 3. He developed contact dermatitis on the arms, trunk and perineum. The doctor's report estimated disability from regular work at two days. An allergy to the pesticides was suggested as the cause by the worker and investigator.

A nursery worker developed an itchy rash all over the body which, when he scratched it, became raised and hive-like. The flowers he was packing had been sprayed with Diazinon and Metasystox-R. The doctor called it an urticarial reaction secondary to exposure to the pesticides or pollens. The doctor said it was hard to determine what was causing this, but was sure it was related to the industrial exposure. There was no period of disability.

A farm laborer running a ground applicator spraying Diazinon AG500 and Maxipreme developed a rash on the chest and back. The investigator reported that the employer had taken all possible precautions, provided protective clothing, gave proper worker safety training and saw to it that all necessary safety equipment was provided and used. There was no time lost from work.

A nursery greenhouse worker had been packing plants sprayed with Diazinon 50W and subsequently developed contact dermatitis on both hands. There was no loss of work. The investigator questioned the prudence of handling the plants so soon after spraying.

An employee of a manufacturing plant received what was described by the doctor as first degree chemical and thermal burns of the right side of the face and major portion of the right arm. Diazinon dust was in the containers that purportedly exploded (according to the employee). The investigator reported that there was no evidence the containers had exploded, and that the ruptured hot water line would seem to have caused the first degree burn.

A nursery worker claimed to have been sprayed when present in a greenhouse where malathion and diazinon were being applied. She became sick a few days after exposure, and the first doctor diagnosed it as flu. However, a second doctor called it contact dermatitis due to chemical spray. The employee lost 13 days of work.

A nursery worker said she smelled spray in the area she was working. Malathion 25WP and Diazinon 50WP were sprayed on plants she had been working with. A rash developed, which was described as severe by one

doctor, and the employee missed 10 days of work. No gloves were worn during work. Discrepancies between nursery employer and employee statements were not resolved.

Eye Exposures

An exterminator was spraying overhead in closets with a respirator on but no goggles. He was spraying Diazinon and Vaponite 2 with a hand pump type sprayer. The doctor estimated two days of disability.

A farm laborer was picking strawberries in a field that had been sprayed with Thiodan and Diazinon AG500. Both of her eyes became irritated and red. The doctor's first report called it an allergic conjunctivtis in both eyes. The investigator recommended that the worker should either wear goggles or perform other work if the symptoms persisted. No work time was lost due to this injury.

Skin-Eye Exposures

A groundsman was pulling weeds in an area that had been sprayed previously with Diazinon AG500. He developed a rash on his lower body and swelling of the eyes. Since some small poison oak plants were discovered growing in the same area, the investigator stated that this might have been a poison oak reaction and not a spray injury. The doctor's first report called the injury milk inflammation of the conjunctiva. The estimated period of disability was three days.

Occupational Exposure Incidents That Occurred During 1976

In 1976, there were 35 occupational exposure incidents involving Diazinon that were reported to the California Department of Food and Agriculture. Of these, 18 involved suspected systemic illnesses, nine involved skin irritation, seven involved eye exposure, and one involved both eye and skin exposure.

Suspected Systemic Exposures

A sales clerk arrived at work two hours after Diazinon 4E had been sprayed in her work area. She stated she had an extremely sensitive nose, and upon smelling the residue, became initially nauseous and later suffered a nervous condition. No time was estimated for disability, and the investigator indicated the clerk was more emotional about smelling the residue than actually being injured by it.

A pest control operator was exposed to Diazinon, DDVP, Dursban, and chlordane daily via skin absorption, and then got sprayed in the face by Diazinon from a broken hose. He suffered periods of diarrhea, poor concentration, a general feeling of malaise, conjunctivitis in both eyes and poor pupil reactivity. The estimated period of disability was three weeks with modified work for an additional three weeks during which time no further exposure to chemicals was to be allowed.

A farm worker exhibited symptoms of upset stomach for a week, and some nausea, but no vomiting after spraying Diazinon AG500. He showed decreased cholinesterase levels and responded to atropine treatment. The man had failed to shower after work and this was thought to have contributed to the exposure since all other protective clothing and equipment requirements had apparently been met. No estimated period of disability was listed on the report.

A structural pest control worker was diagnosed by the doctor as having acute asthma (bronchial) and asthmatic bronchitis due to repeated exposure to pesticides. The patient stated he had a gradual onset of a cough and shortness of breath due to allergies he had developed to the pesticides. The chemicals he used mostly were Chlordane 4, Diazinon 4S, Malathion and 10% Sevin dust. The investigator stated that this man neglected to wear safety articles issued in the line of work. The man no longer works in this job and is permanently disabled from any work which would expose him to pesticide dust or fumes.

A gardener was instructing personnel in spraying when the hose contacted the motor exhaust pipe causing Diazinon AG500 to douse the upper portion of his body, including contact with the face and eyes. He immediately washed and rinsed his eyes and face. The illness was listed in the doctor's first report as ingestion and possible inhalation of Diazinon AG500, with moderate conjunctivitis. The estimated period of disability was not mentioned.

A teacher was working in the gym shortly after it was sprayed with Diazinon. Within three hours the man became ill, showing symptoms of headache, numbness, dizziness, slight nausea, and a cold sweat. He missed two days of work and has had no problems since.

A fireman inhaled fumes through an open window. Diazinon 4E was being sprayed outside the building. Other employees noticed the odor, too, but didn't become affected. The investigator concluded this particular man must have been extra sensitive to the vapors. The doctor's first report described the injury as swelling of the distal pharynx, and severe shortness of breath secondary to insecticide inhalation. The estimated period of disability was seven days.

A structural PCO supervisor was trying to rid an apartment building of bees with a mixture of Diazinon 4E, Namtox and Virchem Cleanout. The man had used all safety equipment but felt that the equipment may have been faulty. The investigator said the label directions seemed not to have been followed completely. The man complained of dizziness, cramps and an inability to breathe well. The investigator stated that the lab work done gave no definite evidence that this illness was pesticide-related. No face shield or goggles were used. The man had no estimated period of disability according to the doctor's first report.

A gardener was exposed to Diazinon 4E while spraying a lawn. He reportedly inhaled the material and was subsequently hospitalized. The estimated period of disability was 40 days, and he stayed in the hospital for two of these days.

A gardener was spraying with Diazinon and became ill. He complained of burning skin and had a headache.

A telephone company employee became exposed to Diazinon when it was used in the building in which she worked. She stated she was more susceptible to this material and got sick as soon as she smelled it. She normally is allowed to be absent on the days the area is sprayed, but the exterminator was a day ahead of schedule. The doctor could not evaluate the reaction and called the examination unremarkable. No time was lost from work.

A gardner-grounds foreman was spraying trees overhead and as a result was covered with Diazinon 500EC mist. He used a respirator but no rubber gloves. He complained of dizziness and light headedness, nausea and pain in the stomach and went to a doctor. The doctor's diagnosis was organophosphate intoxication, he was hospitalized for two days and the estimated period of disability from regular work was two weeks.

A grower-applicator spent 18 hours applying Diazinon to a field. The doctor's first report called this an "insecticide exposure by history". Treatment consisted of advising the man to avoid further exposure.

A nursery worker became exposed to Diazinon WP when he entered a greenhouse to repair a sprayer that wasn't functioning correctly. He suffered a headache and severe pain in the eyes. He had forgotten to wear the protective equipment required by the label. The doctor diagnosed it as chemical pneumonia and estimated the period of disability at two weeks.

A shipping and receiving worker was present during the spraying of Diazinon by a pest control company. He complained of nausea, jittery feelings and light headedness after getting home. The doctor's diagnosis

was possible idiosyncratic reaction to pesticide spray and no time was lost from regular work.

A motel employee was exposed to Diazinon and Procide Tyritherim while sleeping in a room that had been sprayed for roaches. The employee did not heed to the warnings concerning the need for ventilation given by the motel owner and pest control applicator. The doctor's diagnosis was overexposure to hydrocarbons, chemical pneumonia and bronchitis. The estimated period of disability from regular work was three weeks.

A structural pest control applicator was using Diazinon 4S and Vaponite 2. He complained of a bad cough that lasted for one month. The doctor stated he was not sure if the cough was due to pesticide exposure. Respirator, gloves and goggles were all provided and used. No work time was lost due to this incident.

A truck driver was loading plastic cans of Diazinon AG500 when one of the cans developed a leak on top. The driver got some on his hands which caused him to become dizzy and get an upset stomach. Rubber gloves were not furnished nor worn by the truck driver. The doctor's diagnosis was organophosphate poisoning and treatment included atropine. The estimated disability from regular work was two weeks.

Skin Exposures

An exterminator developed a rash and abscesses on both wrists from prolonged exposure to several different pesticides including Diazinon. The injury was diagnosed as contact dermatitis. It was suggested by the investigator that the man might be sensitive to chlordane and diazinon since he reported getting rashes on his arms when working with these chemicals previously. Although safety equipment was used, the protective clothing may not have been adequate. Gloves used were not waterproof.

A farm laborer developed contact dermatitis on the neck and face with minimal involvement on the hands. The accident occurred while the employee was spraying trees with Diazinon. There was no disability time involved in this accident.

While spraying pine trees, a gardener got some Kelthane and Diazinon on the side of the face and in the ear. The doctor's report listed the injury as mild chemical dermatitis and otitis externa.

An assistant gardener decided to spray some shrubs and plants with Diazinon on a very windy day. The regular gardeners were on strike and this man had no formal training on pesticide use or related safety equipment requirements. He wore a long sleeved shirt, rubber gloves, and a painter's mask which wasn't recommended for pesticide use. He also used the pesticide storage locker to hang his street clothes. The doctor's diagnosis was contact dermatitis on the upper parts of the body. No time was lost from work.

A farm laborer was pruning and brushing in an orchard which had been sprayed with Diazinon 50W and oil more than two months earlier. The doctor reported generalized pruitic dermatitis and treated the worker with

Corticosteroids and steroids. No time was lost from regular work. The investigator stated that this might not have been a pesticide illness case caused by the previous sprayings. The employee stated the severe itching was a consequence of working in spray contaminated areas of the orchard, but the doctor thought some areas looked as though insects were a factor in the itching, swelling and burning.

An exterminator developed a rash on both hands and forearms while spraying warehouses with Diazinon 40E and Sevin 50W. The worker reportedly had skin problems of a similar nature to this in previous years. This case of contact dermatitis was treated and no disability period resulted from the injury.

An exterminator developed an allergic dermatitis of the arms, neck and face by contact with various chemicals and insecticides he used in his work. During the week of the injury he was using Dow Dursban or F.M.C. Diazinon 40W. Local treatments and steroids were given, and no work time was lost.

A nursery worker developed a case of dermatitis of the arms and legs which lasted for one week. He had been loading small plants for transport and hadn't been in contact with any other materials. The plants handled had been previously sprayed with Diazinon. The doctor's examination listed multiple hemorrhagic lesions on the legs with similar, but lesser, lesions on the forearms, and minimal lesions on the trunk. The patient was treated. The estimated period of disability was one month.

A pest control employee spilled Diazinon 4S on his shirt and developed a burning rash of the right armpit. Hydrocortisone Cream and Benadryl Capsules were used in treatment. The employee was characterized by the employer as a careless worker. No regular work time was lost.

Eye Exposures

An exterminator got Diazinon 4 in his eye while dusting an attic. The involved eye was sensitive and turned red easily. According to the doctor, this was no severe problem and was a mild reaction to chemicals. The investigator's report stated that the man wore a respirator, but failed to put the goggles on.

A gardener got Diazinon in the eye when a hose broke on the spraying equipment. The doctor called it mild chemical conjunctivitis of the eye, and treatment consisted of Decadron ointment on an eye pad. Safety equipment used was as directed by the label. Disability lasted one day with an additional day of modified work.

A tractor driver was pulling a bean sprayer when his eyes became irritated. He was spraying Omite 30W and Diazinon on almond trees at the time. The doctor diagnosed the problem as moderate conjunctivitis following chemical irritation. The investigator reported the man was wearing gloves and coveralls. No time was lost from regular work.

A pest control operator spraying bees on the outside of a house got Diazinon 4EC and Vaponite 2 in his eyes. The doctor's findings were

swelling just medial to the left eye with twitching and redness. He was wearing protective clothing at the time. No work loss occurred in this incident.

A farm laborer got Diazinon 50W splashed in his eye. He was spraying mushroom houses when the hose broke after he had overtightened the pressure regulator. The investigator reported that the equipment appeared in good condition, and that safety equipment had been provided. The man did not wear the goggles that were provided. The man's right eye was examined and medically treated. No disability time occurred from this accident.

A hose failure on a spray unit allowed Diazinon spray to contact the eyes of a nursery worker. He immediately rinsed his eyes and thus sustained only minor injury. He was treated with Neosporin and missed one day of work.

A greenhouse nursery employee was working with plants that had been sprayed two weeks previous with Captan and Diazinon. Something entered the left eye and within four days the left side of the face was swollen. The doctor stated that the conjunctivitis was secondary to pesticide exposure. No work time was lost due to this accident.

Skin-Eye Exposures

A nursery employee was in range of a sprayer and got Diazinon on her body. The employee complained of swollen and itching face, itching hands and swollen eyes. The injury was charaterized by the doctor as a generalized pruritis from an allergy to the spray used. No information was available concerning the estimated disability time.

Non-occupational Exposures to Diazinon

The Thomas J. Fleming Poison Information Center in Los Angeles serves an area of about five million persons (about one-fourth the population of the state). Each year this center handles about 35,000 calls concerning poison exposure of which about 3,500 involve pesticides. There were 34 calls in 1975 and 46 calls in 1976 that involved exposure to Diazinon. Most of these cases were non-occupational and involved primarily two groups of individuals; small children who accidentally ingested some pesticide and adults who had excessive dermal or inhalation exposure as a result of a poorly conducted application. Most of these exposures resulted in moderate degrees of short-term illness.

Other poison centers in the state have reported similar problems with Diazinon.

DISCUSSION

In surveys of both occupational and non-occupational exposure incidents to pesticides that receive medical attention in California, Diazinon is responsible for a number of the incidents.

In general, this reflects the very extensive use of this pesticide for a broad range of pest problems ranging from agricultural use to use within

the home. The use in the home and garden areas is usually by persons untrained in pesticide usage. Interviews of persons who have become ill from exposure to this pesticide reveal that they had tended to think of this organophosphate as one of modest toxicity such as malathion when in fact it is four times as toxic.

The formulations of Diazinon designed for home and garden use that cause the most non-occupational illnesses are those with more than 15% Diazinon as the active ingredient. It would be desirable to keep the content of Diazinon in such products below 15%. The use of xylene as a solvent should be avoided.

Formulations of Diazinon that result in more numerous and serious occupational exposures are those that contain greater than 45% Diazinon and/or significant quantities of xylene. Xylene as a solvent seriously increases the hazard to the user due to the dermal absorption and inhalation hazard of this solvent. Its presence also increases the absorption rate of organophosphates both through the skin and the respiratory epithelium. Since safer solvents will dissolve Diazinon, the use of xylene should be kept at a minimum and in only those formulations where it is absolutely necessary.

Users and physicians tell us that there is a major problem with the Diazinon labels, as there is with many of the labels for organophosphate pesticides. The special labels required for parathion are among the few labels for organophosphates that adequately inform the users of the risks, how to avoid them, and inform the physician of proper emergency treatment.

As with the parathion labels, all pesticides containing organophoshpates (including Diazinon) should in prominent type (1) inform the user of the hazards, (2) instruct the user of exactly how to avoid exposure, (3) provide the user with adequate first aid instruction, and (4) inform the physician that the product contains a cholinesterase inhibitor and atropine and oximes are antidotal. All of the Diazinon labels reviewed failed in these four areas. Physicians are particularly critical that many organophosphate and carbamate labels do not state that the active ingredient is a cholinesterase inhibitor and what the two specific treatments are. Physicians who are faced with treatment emergencies state that they do not want to waste valuable time calling poison centers or comparing complex chemical names on labels with textbook lists of chemicals.

Significant improvements in the Diazinon labels and all labels of pesticides containing organophosphates should be made. The authors are willing to assist in the review of a standard format for a label for organophosphates designed to alleviate the deficiencies of the currently used labels. Most labels are so vague on informing the user exactly how to avoid exposure, the State of California has had to develop a Pesticide Use Enforcement Guideline For Interpreting Pesticide Label Statements For Protective Clothing and Equipment (Table Six). This use enforcement approach has been taken reluctantly as an interim measure until more specific safe use instructions appear on labels.

Table 1

Occupational Exposures to Diazinon in California
for 1975 and 1976, Reported by Job Category

		1975	1976	Total
Systemic	Subtotal	11	18	29
Nursery		0	1	1
Gardener		3	4	7
Ground Applicator		0	2	2
Indoor Worker		8	6	14
Structural		0	4	4
Other		0	1	1
Skin	Subtotal	7	9	16
Ground Applicator		1	1	2
Nursery		5	2	7
Gardener		0	1	1
Manufacturing		1	0	1
Structural		0	4	4
Other		0	1	1
Eye	Subtotal	2	7	9
Ground Applicator		0	1	1
Structural		1	2	3
Field Worker		1	0	1
Nursery		0	2	2
Gardener		0	2	2
Eye and Skin	Subtotal	1	1	2
Gardener		1	0	1
Nursery		0	1	1
	Total	21	35	56

Table 2

Occupational Exposure to Diazinon in California
for 1975 and 1976, Reported by Duration of Disability*

	1975	1976	Total
Systemic			
Hospitalization			
1-6 days	2	1	3
Days of Work Missed			
None	2	4	6
1-7 days	4	1	5
7-14 days	2	4	6
14-30 days	1	3	4
30-45 days	0	1	1
Permanent disability from work	0	1	1
Unknown	2	4	6
Skin			
Days of Work Missed			
None	3	6	9
1-7 days	1	0	1
7-14 days	1	0	1
14-30	1	1	2
Unknown	1	2	3
Eye			
Days of Work Missed			
1-7	2	2	4
None	0	5	5
Eye and Skin			
1-7	1		1
Unknown	0	1	1
Total	21	35	56

* The period of disability is estimated by the physician at the time of initial examination.

Table 3

Occupational Exposures to Diazinon in California
for 1975 and 1976, Reported by County of Occurrence

County	1975	1976	Total
Los Angeles	10	6	16
Alameda	3	5	8
Orange	1	3	4
Sutter	1	1	2
San Mateo	1	3	4
Ventura	1	2	3
San Joaquin	3	1	4
Santa Cruz	1	0	1
Merced	0	1	1
San Francisco	0	2	2
Yolo	0	1	1
San Diego	0	5	5
Monterey	0	1	1
Kings	0	1	1
Fresno	0	1	1
Santa Clara	0	1	1
Imperial	0	1	1
Total	21	35	56

Table 4

Occupational Exposures to Diazinon in California
by Month of Occurrence for 1975 and 1976

Month	1975	1976	Total
January	0	2	2
February	0	2	2
March	1	0	1
April	1	5	6
May	1	4	5
June	2	3	5
July	2	3	5
August	5	5	10
September	1	3	4
October	3	2	5
November	4	2	6
December	0	1	1
Unknown	1	3	4
Total	21	35	56

Table 5

Formulations of Diazinon Involved In
Occupational Exposures in California in 1975 and 1976

Trade Name	Registration Number	Type of Formulation	Percent of Diazinon Present	Solvent
Diazinon	N/A*	N/A	N/A	N/A
Diazinon (Geigy)	00100-00464AA	N/A	N/A	N/A
Diazinon 50W (Ciba-Geigy)	00100-00460-AA	Wettable powder	50.0	None
Diazinon Dust (Ortho)	N/A	Dust	4.0	None
Diazinon	N/A	N/A	N/A	
Diazinon 50W (Geigy)	00100-00460-AA-0000	Wettable powder	50.0	None
Diazinon (Ciba-Geigy)	00100-00463-AA	Emulsifiable solution	47.5	Aromatic petroleum derivative
Diazinon AG500 (Ciba-Geigy)	00100-00461AA	Emulsifiable solution	48.0	Xylene
Diazinon AG500	00100-00461AA	Emulsifiable solution	48.0	Xylene
Diazinon AG500 (Ciba-Geigy)	00100-00461AA	Emulsifiable solution	48.0	Xylene
Diazinon 50W (Ciba-Geigy)	00100-00460AA	Wettable powder	50.0	None
Diazinon 4S (LACO)	00962-50163AA	Oil solution liquid	48.7	Aromatic petroleum derivative (Chevron-100 solvent)
Diazinon (4S) 4F (Geigy)	00100-00466AA	Oil solution	48.7	Aromatic petroleum (Solvesso-100) derivative
Diazinon 4 O.B. (Target Chem)	11214-00010AA	Oil solution	48.7	Aromatic petroleum derivative
Diazinon 4 O.B.	11214-00010AA	Oil solution	48.7	Aromatic petroleum derivative
Diazinon	N/A	N/A	N/A	N/A
Diazinon, Pyrethins Piperonyl Butoxide (Bulk Insecticide Company)	N/A	N/A	N/A	N/A
Diazinon 4-E (Hub State Corp.)	EPA EST 5602-IN-01	Emulsifiable solution	47.5	Aromatic petroleum derivative
2% Diazinon (Geigy)	00100-00445	Dust	2	None
Diazinon AG500 (Geigy)	00100-00461AA	Emulsifiable solution	48	Xylene
Diazinon	N/A	N/A	N/A	N/A
Diazinon (Target Chem)	11214-00010-AA	Oil solution	48.7	Aromatic petroleum derivative

*Not Available

Trade Name	Registration Number	Type of Formulation	Percent of Diazinon Present	Solvent
Diazinon 4E (Namco)	00531-00647AA	Emulsifiable solution	47.5	Aromatic petroleum derivative
Diazinon	N/A	N/A	N/A	N/A
Diazinon AG500 (Ciba Geigy)	00100-00461-AA	Emulsifiable solution	48.0	Xylene
Diazinon 4S Prentox	00655-00462AA	Oil solution	48.7	Aromatic petroleum derivative
Diazinon AG500 (Ciba Geigy)	00100-00461AA	Emulsifiable solution	48.0	Xylene
Diazinon 4-E (Geigy)	00100-00463-AA	Emulsifiable solution	47.5	Aromatic petroleum derivative
Diazinon 4E	05316-00047AA	Emulsifiable solution	47.5	N/A
Diazinon 4S (Namco)	05316-00046-AA	Oil solution	48.7	Aromatic petroleum derivative
Diazinon	N/A	N/A	N/A	N/A
Diazinon 40WP	00279-02932-AA	Wettable powder	40.0	(Microcel-E)
Diazinon 40E (Target Chem)	11214-00010-AA	Oil solution	48.7	Aromatic petroleum derivative
Diazinon (Chevron)	N/A	N/A	N/A	N/A
Diazinon	N/A	N/A	N/A	N/A
Diazinon	N/A	N/A	N/A	N/A
Diazinon	N/A	N/A	N/A	N/A
Diazinon	00100-00460AA	Wettable powder	50.0	None
Diazinon (Geigy)	00100-00460	Wettable powder	05.0	None
Diazinon	N/A	N/A	N/A	N/A
Diazinon 50W (Geigy)	00100-00460AA	Wettable powder	50.0	None
Diazinon (Ciba Geigy)	00100-00460AA	Wettable powder	50.0	None
Diazinon 4 (Moyer Chemical Co.)	05967-00122-AA	Dust	4.0	None
Diazinon (Ciba Geigy)	00100-00461AA	Emulsifiable solution	48.0	Xylene
Diazinon 4EC (FMC)	00279-02945-	Liquid	48.0	Xylene
Diazinon 4E (Namco)	05316-00047-AA	Emulsifiable solution	47.5	Aromatic petroleum derivative
Diazinon 4E (Geigy)	00100-00463AA	Emulsifiable	47.5	Aromatic petroleum derivative
Diazinon	N/A	N/A	N/A	N/A
Diazinon 4E (Namco)	05316-00047-AA	Emulsifiable solution	47.5	Aromatic petroleum derivative
Diazinon 500 EC (Occidental Chem)	07001-00177AA-	Liquid	48.2	Xylene
Diazinon 50WP (Geigy)	00100-00460-AA	Wettable powder	50.0	None
Diazinon	N/A	N/A	N/A	N/A

Trade Name	Registration Number	Type of Formulation	Percent of Diazinon Present	Solvent
Diazinon 4S (Namco)	05316-0046-AA	Oil solution	48.7	Aromatic petroleum derivative
Diazinon 4S (Namco)	05316-0046-AA	Oil solution	48.7	Aromatic petroleum derivative
Diazinon AG500	00100-00461AA	Emulsifiable solution	48.0	Xylene